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ABSTRACT

The booklet describes the efforts planned by the Washington Research Organization (UWRO) to study ways in which generalization of skills may be facilitated by severely retarded individuals. It is explained that activities of UWRO are organized around four major tasks: descriptive and laboratory research; research in natural educational settings; evaluation; and communication about ongoing studies, procedures, and products. The circular administrative structure of UWRO is diagramed and makeup of the advisory committee described. A section of basic research concepts focuses on such topics as skill generalization, instructional programming for generalization, and methodological aspects. Four approaches to generalization are proposed: an ecological approach to describing and then altering conditions within the educational environment; a performance pattern approach to describing and matching individual learning characteristics and instructional techniques; a self-control approach in which severely handicapped students learn to manage their own behavior; and a cognitive strategy approach that focuses on helping students use higher order levels of thinking. Each of the approaches is described in terms of background and purpose of studies, design of studies, and expected outcomes and products. (CL)

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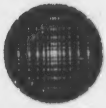

Washington Research Organization

Research in Education of the Severely Handicapped

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INVESTIGATING THE PROBLEM OF SKILL GENERALIZATION

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Foreword

It is only within the short span of the last two decades that teaching models for the severely handicapped have been successfully demonstrated. As a result of systematic instruction, the severely handicapped have demonstrated that they have the ability to acquire self-help, social, and vocational skills.

Having attained some success, educators of the severely handicapped must face another problem: acquisition of skills rarely guarantees that the individual can apply those skills in natural settings. The process of adapting skills from instructional to natural settings is called generalization.

The generalization phenomenon has been recognized and studied in research laboratories for many years, but the need for strategies to facilitate generalization has never been more critical than it is now. As we face the integration of severely handicapped persons into all facets of society, we realize that the main stumbling block is the difficulty these individuals encounter in generalization.

As we examine the natural setting, we see the multitude of unpredictable variables that stand in the way of adaptation for the severely handicapped. Each new stimulus demands generalization within a class of responses to fit the particular situation in the environment.

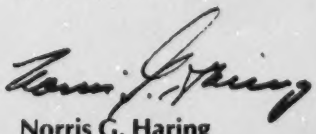
Up to now, educators have relied upon two strategies for generalization. The first, what Trevor Stokes and Don Baer have called "train and hope," involves thorough training during the acquisition phase and hope for later

generalization. The second, identified by Lou Brown, utilizes the "criterion of ultimate functioning" to assure that all the skills taught have an ultimately useful purpose or function.

Educators, following the course of least resistance, have tried to conduct their instruction in the natural setting. This "practical" approach is simplistic and difficult to achieve. Educators must search for appropriate natural environments, but effective teaching involves unavoidable adaptation of those environments.

A further problem is that the natural setting may not provide sufficiently predictable opportunities for severely handicapped persons to practice particular new skills. Thus it is inefficient to develop large numbers of new skills in this way. The challenge raised by the current difficulties is to determine whether or not skills can be developed to an acceptable rate within an instructional environment and then transferred to the natural environment.

Educators and advocates all over the United States have expressed the need for solutions related to facilitating generalization. As a result, the U.S. Department of Education's Special Education Programs (SEP) has set aside funding for study and analysis of generalization processes with the severely handicapped. The Washington Research Organization is pleased to participate in these efforts.



Norris G. Haring
Principal Investigator
Seattle, 1983

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Ms. Cindy Burchart is pleased with her new job at the Seattle Hotel. She has loaded the industrial dishwasher for the first time: all of the plates on the bottom in neat rows and all of the glasses on the top. It was easy to figure out where they went. She closes the door with satisfaction. But where are the buttons to start the machine? They're not on the front of the machine, nor on the side. Behind the dishwasher, on the wall, Cindy sees a row of buttons, switches, dials, and lights. Some of the lights are dark, while others are glowing red or green. She stands bewildered before the display. The manager of the kitchen rushes over, glares at Cindy, and rapidly pushes some buttons, sets a dial, and flicks a switch. He barks, "Start on the next load," wondering why he ever agreed to give a retarded person a chance, anyway.

Mr. White gazes at the assessment data for Richard. He is depressed. This is the third year he has had Richard in his class, the third year he has conducted assessment, and the third year he must prepare instructional objectives for Richard's IEP. Last year he taught Richard to say, "My name is Richard Clark," when asked, "What's your name?" or "Who are you?" This year, he only answers with, "Richard." "That really won't help if he gets lost," sighs Mr. White. He ruefully writes the objective for "says own name" for the second year in a row. He looks at some more assessment data, collected over the first six weeks of school. It is taking Richard even longer to learn to say his address than it did to say his name, and it looks like there is no guarantee that he will remember that next year. Mr. White considers just getting him an i.d. bracelet, but remembers what Richard's parents said. He writes an objective for "says own address" and shakes his head.

Jody is screaming so loudly that his face is eggplant purple. Mrs. Loomis stares helplessly at him. She goes over and picks up the tennis shoes from the corner where he threw them moments ago. She knows that Jody's teacher told her that Jody was able to put on these very same shoes without any help. The screaming is now broken by gasps, as Jody winds up to an even higher pitch. Mr. Loomis yells up the stairs, "Where are you? We're all in the car waiting!" Mrs. Loomis quickly picks up Jody, puts his shoes on him, and carries him down stairs. Jody quits screaming when they go out the door. "Thank goodness," she says to herself.

ONE

THE WASHINGTON RESEARCH ORGANIZATION

The problem for Cindy, Richard, and Jody is generalization, or the lack of it, to be more precise. The setting changes, time passes, and it is somehow as if they had never learned what to do in the first place. This is one of the most important problems we have had to face since we began educating severely handicapped students. It is one that must be solved if education is to be an effective preparation for life in society.

The Washington Research Organization (UWRO), located on the campus of the University of Washington in Seattle, was awarded a five-year contract by the U.S. Department of Education's Special Education Projects (SEP) in October of 1982. The mission of UWRO is to identify instructional strategies through empirical investigations that enable practioners to promote generalized responding by severely handicapped persons. If the research we conduct is productive, we will develop practical instructional methods that ensure that severely handicapped individuals are able to use learned skills in environments outside of the training setting, and that those skills remain useful long after formal education has ceased. We will also take steps to see that the methods we develop are available to all practioners.

A sequence of objectives will need to be met if we are to be successful in accomplishing our mission. First, UWRO investigators will conduct descriptive and intervention research to identify specific environmental, instructional, and individual characteristics that affect the probability of generalized responding. Although variables so identified may increase our understanding of generalization, little of practical value is accomplished by identification alone. Our second objective is to conduct research designed to test the effects of manipulating or changing environmental, instructional, and individual performance variables. Third, UWRO investigators will conduct intervention research in controlled and natural settings to determine instructional and curricular strategies that increase the probability of generalized responding. This leads us to our fourth objective. Teachers and other practioners will be trained in instructional methods and curricula identified by UWRO research, in order to determine whether procedures may be implemented effectively and practically, within operating and budgetary constraints of educational settings.

The success of meeting each objective will be determined by changes in pupil performance data, and by determining the overall practical impact of such changes. The effects of interventions will be evaluated according to the change in frequency, quality, and quantity of generalized responding from pre-intervention levels. The results of UWRO's studies will be evaluated according to psychological and educational research standards for reliability, validity, methodological considerations, and analytic techniques. The extent to which severely handicapped individuals successfully demonstrate generalized behavior will be the extent of our success in meeting these objectives.

The activities of the Washington Research Organization are designed to meet these objectives and are organized around four major activity categories ("tasks"): descriptive and laboratory research, research in natural educational settings, evaluation, and communication. These tasks will be supported by the activities of the Advisory Committee and by project management. This overview describes the activities of UWRO, basic concepts in generalization research, and our four different approaches to the problems encountered by Cindy, Richard, and Jody.

Research in Generalization

Research in generalization constitutes the major activity of the Institute. These activities are divided into two categories, "Descrip-

tive and Controlled Laboratory Studies" (Task 1) and "Research in Natural Settings" (Task 2). Task 1 activities are designed to identify precise variables that affect generalization and to test specific strategies under tight experimental control. They will be conducted primarily during the first two years. These studies are designed to provide the background information needed so desperately in our understanding of generalization.

Task 2 research will investigate the effects of interventions in natural educational settings. In the fourth project year, Task 2 research activities will include investigations of the efficacy of guidelines developed for practioners from UWRO research. The guidelines will define how procedures are to be applied in natural settings. These investigations will seek to determine how applying the guidelines affects the generalization demonstrated by severely handicapped individuals, and also how guidelines might be improved for more accurate and effective implementation.

We are fortunate to have established cooperative arrangements with three local school districts to provide the settings and subjects for our research. These three local educational agencies are Lake Washington School District No. 414, North Shore School District No. 417, and Issaquah School District No. 411. Personnel from these districts will work closely with the Senior Investigators, providing the first contact with parents, guardians, and teachers and arranging for research settings.

Representatives of the districts will meet with UWRO staff as members of the Direct Service Consortium. Ralph Bohannon, Director of Special Services for Lake Washington, is an experienced researcher and has cooperated in previous University of Washington research projects. This large district is also represented by Nancy Wilson, Principal of the Gordon Hauck Center; Ruth Hayes, Special Education Administrator; and Joyce Vanden Hoorn, Administrative Assistant. Fred Rowe, Director of Special Education, represents North Shore. Lorna Tripp Wilturner, Director of Special Education, will represent Issaquah as well as the UWRO Advisory Committee, of which she is a member. Joining the representatives of the cooperating districts is Gregory Kirsch, Director of Special Education for the state educational agency.

Research may also be conducted in the Experimental Education Unit (EEU) of the Child Development and Mental Retardation Center, located in the University Affiliated Facility at the University of Washington. Karen Morris is the principal of the EEU, which currently serves severely handicapped pupils from seven

surrounding school districts. Pupils are placed at the EEU when administrators, parents, and teachers determine they would be better served at the EEU rather than in their local programs. All of the pupils live with parents, guardians, or in group homes away from school. The EEU is in session all twelve months of the year, which will permit UWRO to conduct research during the summer.

Evaluation

Each of the objectives is a necessary step in achieving our mission. Evaluation of our progress in meeting the objectives is an ongoing process and constitutes Task 3 of the Institute. Three general classifications of data will be collected for overall Institute evaluation: intervention, formative, and summative.

Intervention data, which will serve as the primary basis for evalution, are measures of the actual performance of the subjects during instruction and in nontraining settings, collected during the research activities. UWRO is conducting a wide range of carefully designed studies in an attempt to identify and develop procedures which will help severely handicapped persons to generalize and effectively use the skills they learn. The data collected on the performance of severely handicapped pupils during the research studies will be analyzed by a variety of procedures, including visual inspection of graphed data, trend analyses, and time series analyses for repeated measurement of single subjects. Analyses of group data will utilize correlational and standard tests of statistical significance. Standard analytic practices will determine if an intervention has an effect on subject performance, and the extent of such effects. Data will also be compared to the performance of students participating in the long term study of educational environments, described in the first section of Chapter 3.

Many studies will begin in very special settings where the greatest control over conditions can be exerted. It should be noted, however, that all research studies include specific time lines for moving into applied settings -- schools, homes, and the community -- and evaluating the impact of findings in the "real world." Each line of study is designed to culminate in a material product, such as a manual or set of materials, which describes exactly how the parent, teacher, or other practioner can use UWRO's findings to facilitate skill generalization. Since things which are possible are not necessarily easy or efficient, cost studies will be undertaken to evaluate the time, energy, and resources required for implementing the procedures recommended by URWO. If necessary, recom-

mended procedures will be modified and retested to make them more easily understood and implemented within the typical applied setting.

Some research designs disregard the fact that statistically significant effects obtained in controlled studies may not have any practical value in normal situations. Therefore, the evaluation of the UWRO will rest very heavily on demonstrating that its work is actually having an impact on the lives of severely handicapped persons, not in special laboratories or experimental programs, but in their regular classrooms, homes, and places of work.

The purpose of formative evaluation is to demonstrate the extent that research and communication activities contribute to the development of UWRO's research and attainment of our overall mission. Formative evaluation will incorporate data and descriptions documenting existing research and demonstration procedures reviewed, applications and adaptations of existing procedures, and research activities utilizing existing procedures. Products which result from UWRO's contacts with other institutes and agencies will be reported. Any products disseminated as a result of either individual studies within UWRO or through contact and collaboration with researchers outside UWRO will also be documented.

Summative evaluation contributes to assessment of the lasting impact of UWRO's various activities. We will collect and analyze data on (1) the extent to which UWRO's research and intervention procedures and materials are adopted by local educational agencies, (2) evidence of the quality of research skills acquired by UWRO Research Assistants, (3) evidence of cost savings resulting from implementation of UWRO-developed procedures, (4) the adoption of UWRO-developed procedures in teacher preparation and inservice training courses, (5) changes in peer interactions resulting from UWRO research and intervention procedures and products, and (6) the overall attainment of UWRO's goals. These data will be disseminated to the other institutes and researchers in the field on an annual basis, for their information and to stimulate interaction with UWRO. This documentation also will serve as evidence of any "ripple effects" produced by UWRO efforts.

Finally, the overall impact of UWRO's efforts must be measured in terms of how much generalization is facilitated. This will be evaluated by conducting extensive inservice training seminars for teachers, parents, administrators, and other training professionals and determining, through follow-up evaluation, the extent to which

the participants adopted the procedures and whether there was any demonstrable beneficial impact on the lives of their children or clients by increasing the nature or extent of generalization from "pre-UWRO" levels. That will represent the most meaningful evaluation of UWRO's success.

Communication

Communication about ongoing studies, training, and dissemination of procedures and products derived from our research is an important component of the UWRO mission. Cooperation with other researchers exploring issues related to skill generalization is the necessary first step in maximizing the potential benefits of UWRO activities. We will be working closely with the three other Institutes for Research in Education of the Severely Handicapped.

Two of these institutes will focus on methods of facilitating integration from restrictive to least restrictive educational environments. The University of Minnesota's "Consortium Institute for Education of Severely Handicapped Children" directed by Luanna Voeltz, and San Francisco State University's "California Research Institute on Transition of Severely Handicapped Students to the Least Restrictive Environment" directed by Wayne Sailor, will study the ways and means of integrating severely handicapped students with their nonhandicapped peers. Another institute will also study generalization. "Extending Competent Performance: An Institute for the Study of Generalization with Severely Handicapped Students" is under the direction of Robert Horner at the University of Oregon. Since the process of integration is likely to involve the necessity of generalized responding in "new," integrated environments, the work of each institute will relate directly to the work of the others.

The four institutes are committed to maintaining active interaction with one another. Researchers may assist each other by replicating various procedures or interventions. Conclusions drawn at one institute may be incorporated into designs for studies at other institutes. We will also be able to share our failures -- important information that is seldom published -- to prevent investigation of ineffective procedures. Methodological problems and solutions can be shared, preventing duplication of mistakes. Under normal circumstances, new data are seen by other researchers only after they appear in a professional journal. Since the publication process often takes as long as two years, relevant data may not be available when needed. This problem will be circumvented by monthly communication and inter-institute meetings. Data from the other

three institutes will affect the direction and content of our research, and stimulate creative approaches to our work.

The second important communication activity is training. This activity will commence with the training of Research Assistants by Senior Investigators. Efforts will be made to employ Research Assistants who are students enrolled in graduate programs in Special Education and related fields. These potential researchers and professionals will acquire training in those skills required to conduct different types of research in laboratory and applied settings. At the same time, they will acquire experience in promoting generalization in educational settings. We expect training of Research Assistants to be conducted continuously during the project.

The results of individual studies in generalization conducted by UWRO, as well as the results of studies conducted within other research institutes, will be disseminated via courses taught by Senior Investigators who are also teaching faculty at the University of Washington. Consultations and workshops given by Senior Investigators at other agencies, colleges, and universities may include results to date.

During the third project year training in instructional and curricular procedures will involve personnel from Direct Service Consortium schools. Training will be conducted by UWRO staff. The nature of the training will depend on the requirements of the local educational agency and will focus directly on the application of procedures in natural settings. Opportunities for training will be extended to personnel from all local educational agencies in Washington during the fourth project year in cooperation with the Office of the Washington State Superintendent of Public Instruction.. As information from the "guideline" studies is collected, training content will be modified. During the fourth project year, it is expected that the training will emphasize the guidelines for each area and practical methods of integrating the approaches in educational settings.

Training is perhaps the most active communication process, but it will reach only a small percentage of interested professionals. In order to increase the potential benefits of UWRO procedures, technical information and the guidelines for practical application will be disseminated through publications and direct mailings.

Technical information will include precise and detailed descriptions of research methodology, analytic procedures, the relationship between the research conducted by UWRO and the existing body

of research information, and presentation and discussion of the results of individual studies. Technical information will be in the form of individual articles prepared for journals, in proceedings from the inter-institute conferences, in annual "Review of the Literature" publications, in Annual Reports from UWRO, in the Final Report, and in the Research Monograph to be produced during the fourth and fifth project years. This information will also be disseminated through discussions with researchers at inter-institute meetings, at national conferences, and at quarterly professional seminars conducted at the University of Washington.

UWRO will produce several publications of "best practices" guidelines. These materials will be assembled for specific audiences, including teachers, teacher trainers, parents, supervisors, administrators, curriculum specialists, and related professionals. A wide variety of persons interested in the research will receive this practical information, which will be disseminated via training, presentations at conferences, and mailing of project products. National dissemination targets will be identified, but persons interested in receiving project information will be able to contact UWRO directly and obtain any product at a small cost.

UWRO's activities will be of little ultimate value if the results are not available to those who need them. Communication activities will include cooperation, training, and product dissemination.

Advisory Committee

To ensure that research will have practical application to a wide variety of potential consumers and to provide advice from professional perspectives, administrators, parents, researchers and others met during the formulation of the UWRO proposal. Now meeting as the Advisory Committee, they provide advice on ongoing activities and assist the project in maintaining a practical approach to the education of the severely handicapped. The members represent the full range of professional activities and service delivery systems in the State of Washington.

Local educational agencies are represented by three individuals: Genevieve Fisher, Chairwoman of the Advisory Committee, Coordinator of Child Find and Staff Development for Tacoma School District No. 10; Lorna Tripp Wilturner, Director of Special Education for Issaquah School District No. 411; and Bill Tilley, Director of Special Education for Seattle School District No. 1. Intermediate educational agencies are represented by Donald Whitney, Director

of Special Services for Educational Service District No. 121, which serves 36 local education agencies. Judy Schrag is the Assistant Superintendent for the Division of Special Services in the Office of the Washington State Superintendent of Public Instruction and will be our liaison with the state educational agency. Al Bauer represents the 49th Legislative District in the Washington State Senate and sits on the Rules, Ways and Means, Financial Institutions, and Local Government Committees. Joseph Jenkins is Director of the Experimental Education Unit and a member of the faculty of the College of Education of the University of Washington. A noted researcher, he will contribute information from the perspective of a researcher and as a representative of an institution of higher learning. Margo Thornley is Executive Director of the Wiser Vocational Institute, which provides vocational evaluation and training to severely handicapped individuals. She represents other service agencies on the Advisory Committee. Kathleen Knowlan is a student in Speech and Hearing Sciences at the University of Washington. She has completed a B.A. in Communication Disorders and plans to complete a graduate program in Clinical Speech Pathology. She is the parent of a handicapped child. Together, these individuals will bring a wide background of experience, a variety of perspectives, and a sincere interest in the education of the severely handicapped to assist the Washington Research Organization in meeting its goals.

Administration and Management

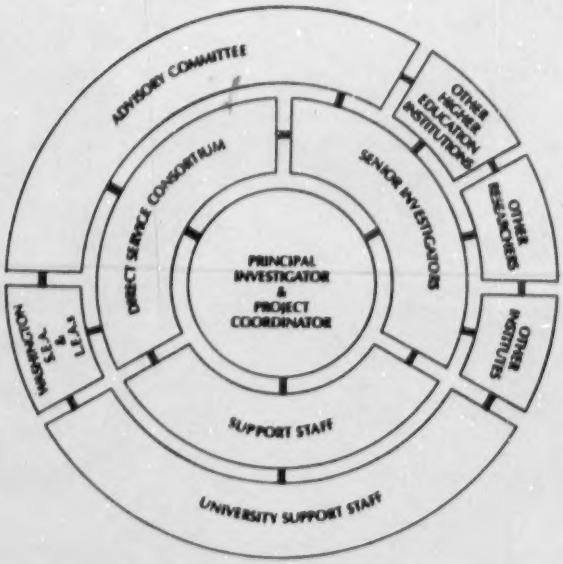
Administrative activities support the research, evaluation, and communication tasks of the Institute. General administrative tasks relating to employment, personnel management, purchasing, budgeting, and federal reporting requirements are covered by this task.

While such administrative tasks are conducted in every organization, the structure of UWRO is designed to facilitate our unique activities. Rather than an hierarchical system where responsibility and information flows from "top to bottom," we have a circular structure. Information flow is both circular, within the rings, and linear, to and from each circle. In addition, most personnel will participate in more than one group, thus increasing the nonhierarchical structure of communication.

The overall responsibility for UWRO activities rests with the Principal Investigator and the Project Coordinator, but decision making

is shared by all groups. Individuals will make decisions related to activities for which they are responsible. Decisions for group and intergroup activities will be reached by consensus. The model for communication at UWRO is shown in the following chart.

UWRO Organizational Structure



TWO

BASIC RESEARCH CONCEPTS

Skill Generalization

Sometimes we want generalization to occur and other times we do not. For example, if we are successful in decelerating or eliminating maladaptive behaviors during training, such as spitting and hitting, we want those behaviors to not occur in other environments. The aim of such programs is generalization of nonresponding. Since special conditions and circumstances surround this kind of training, and since instances of maladaptive behaviors may actually decrease as skill and competence increase, very little of UWRO's research will be concerned with the generalization of "no response." Most of the time, as educators, we do want generalization to occur. If we train toileting at home, we want to see toileting at school. Generally, the behaviors we train may be called "skills" or "skilled behaviors," because they provide the student with the competencies needed for normal living; these will be the ones of most interest in our investigations.

Broadly speaking, skill generalization is appropriate responding in the absence of programmed training procedures. Severely handicapped individuals are taught specific responses under special conditions involving instructional techniques developed through experimentation. These techniques involve a variety of elements, including the events that immediately precede the response, such as verbal directions (e.g., "Get dressed." "Put on your shoes."). These antecedents may come to control the response and are then called discriminative stimuli for responding. The student responds when discriminative stimuli are present, and does not respond when they are not. Other discriminative stimuli may include specific materials or objects (T-shirt, shoes) used during instruction, the setting of the instruction (the desk, the room) and the trainers involved. Instructional techniques also involve events that follow one or more responses, like praise or candy ("Yes, that's the way to get dressed."), or feedback on incorrect responses ("No, that goes on your other foot."). These events are called consequences. Consequences are usually arranged to follow the response; their occurence is contingent upon the response. Contingencies are

scheduled during training, and may vary from one consequence for each response to one consequence for several responses.

Generalization is concerned with the performance of the response outside of training settings. When the specific events that occurred during training are not available, different stimuli may serve to signal the response. Outside the training setting, contingencies for responding are different; consequences may or may not follow the response. In analyzing why generalization does or does not occur, investigators have found it useful to examine separately each of the areas where differences exist: in stimuli, people, consequences, settings, and over time.

When the student responds appropriately to untrained instances, objects, or cues, "generalization across stimuli" is said to occur. For example, instruction in putting on shoes may have included only loafers; if the student is able to put on a slipper, using the same motor skills in her response, generalization across stimuli has occurred. In cases where generalization does not occur, it has been hypothesized that discrimination training has been so successful that the student will respond only to stimuli that are identical to the training stimuli. When the stimuli change, the student "recognizes" the change, and thus does not respond. If the student does respond to stimuli that are similar to the trained stimuli, then generalization has occurred.

Another problem area in generalization appears to involve the trainers. Often trained responses occur only in the presence of the people who trained the response, even if the same antecedents and consequences are involved. When the student responds appropriately to people who did not train him, "generalization across people" is said to occur. For example, if the student has been taught to say, "Hi, my name is Charles," and is able to respond to a stranger's introduction with those appropriate words, generalization across people has occurred.

Many instructional situations, especially during skill acquisition, involve consequences for each response. One to one contingencies are unusual outside of acquisition programs. Also, the consequences available during instruction, such as candy or hugs, may not be as available after instruction ceases. When the student responds appropriately in the absence of the consequences available in the training environment or to different contingencies of consequation, "generalization across consequences" is said to occur. For example, training procedures may have included candy for each correct response. If the student responds appropriately

and continues to respond with only intermittent praise, generalization across consequences has occurred.

"Generalization across settings" is a broad descriptor which incorporates each of the types described above and generally defines the incredible variety of changes that occur when the student is expected to respond in new settings. For example, training a pupil to identify buses by number, to enter the bus, to pay for his fare, and to exit from a bus at his destination may all occur within a classroom setting. However, the student must be able to apply this learning to actual travel. If successful, generalization across settings has occurred. The differences between the training setting and the actual use of city buses are so many and so varied that this category is used to describe the collective differences.

We include another category of generalization, "generalization across time." If the response continues to be performed appropriately after training ceases, generalization across time has occurred. This is also called "maintenance" or "retention," but since training has ceased, the conditions have changed (i.e., antecedents and consequences may be different or presented irregularly), and thus a response that maintains may be appropriately described as generalization.

So far, generalization has been described as occurring when the trained response is performed under untrained situations. However, the true purpose of teaching generalized responding is to provide the individual with means of adapting to new situations, solving problems, and living in different settings. Each response should be appropriate. "Hi, my name is Charles," may be said perfectly in a new setting, but if it follows the stimulus, "Put on your jacket," it is entirely wrong.

If the true aim is getting along in new environments, then the response must also be modified, or physically adapted, to fit the setting. Many instances of generalization involve changes in the physical actions that constitute the response. For example, putting on a T-shirt with long sleeves requires slightly different physical movements than putting on a short-sleeved T-shirt. In other cases very different physical responses will be required to achieve the same effect as that achieved by performing the trained response. For example, training a student to put on a shoe achieves the effect of covering and protecting the feet. Putting on a pair of rubber boots achieves the same effect, but physically different responses are usually involved.

Other problems must also be solved if the student is to respond successfully in new environments. One method of solving problems in new environments is to combine two or more responses that were learned separately. For example, the student may learn how to reach for and grasp something on a shelf above his head. In another training situation, he may be taught how to stand on a chair. If he were to successfully use both of these skills to get his lunch from a high closet shelf without training or prompting, he would have solved a typical problem situation that may occur whenever he is in a different environment. When decisions are required, a response adapted, or a problem solved, generalization involves much more than simple application of a learned skill; it involves adaptation. UWRO investigators will study both types of generalization: application and adaptation.

Instructional Programming for Generalization

Until recently, many people expected generalization to occur spontaneously after training; a "passive" approach to instructing for generalization has been common. We know now that the "train and hope" method does not result in much generalized responding by the majority of severely handicapped students. Trevor Stokes, of the University of Manitoba, and Don Baer, of the University of Kansas, published a major analysis and summary of research in generalization in 1977. This article, and the discussion it provoked, had a major impact on shaping subsequent research in generalization. They argued that it is better to view generalization as an active process and to try to develop instructional methods that ensure that generalization does occur.

Stokes and Baer identified methods in addition to "Train and Hope" that had been reported in published research. In "sequential modification," the behavior is trained in one setting and then, if generalization does not occur in the next setting, training is programmed for that setting, and so on for each setting. This is actually not a very practical solution to the problem by itself, since it would mean that training would have to occur in every setting and each time the individual moved to a new setting.

A similar technique, which Stokes and Baer feel is more promising, requires including many different types of similar antecedents into the training situation. By "training sufficient exemplars," the individual is thought to learn a general category of items or objects to

which to respond. For example, instead of teaching "putting on a sweater" with just long-sleeved-crew-necked sweaters, V-necked sweaters, short-sleeved sweaters and so on are trained. With more varied instructional antecedents, generalization to untrained sweaters (e.g., turtlenecks) may occur.

An extension of this technique was classified by Stokes and Baer as "train loosely," in which many different antecedent events are introduced during training. For example, instead of prefacing each trial, "Put on your shoes," the student may hear, "Put it on," or "It's time to go outside, shoes on," or even be given the shoes without any verbal direction. The more specific "program common stimuli" technique would be to identify stimuli commonly found in different environments and include those in the training setting.

In addition to problems associated with antecedent stimuli, it has been hypothesized that generalized responding does not occur or maintain because the consequences available in natural settings either are not reinforcing to the individual or do not occur as frequently as they did during training. Research data has already shown us that if a response that has been frequently reinforced is performed under infrequent reinforcement, that response is likely to disappear -- to be extinguished. The technique "use indiscriminable contingencies" involves gradually replacing training consequences and schedules with those available in natural settings. In this manner, naturally available consequences acquire reinforcing powers through pairing with programmed consequences, before training consequences are discontinued. Similarly, the schedule of one consequence for each response commonly used during training is gradually replaced with a schedule of intermittent consequences, so that the student is unable to discriminate when a response is likely to be reinforced and when it is not. This method is designed to ensure that generalized responding will occur and endure with the infrequent natural consequences available outside of training settings.

Another method identified by Stokes and Baer is to gradually introduce the individual to "natural maintaining contingencies." This can be achieved most easily by teaching behaviors that are functional in nontraining settings. For example, teaching appropriate eating behavior would introduce the child to the contingencies that occur naturally for such behavior, such as compliments, access to different foods, opportunities to eat at restaurants, or outings with family and friends. The natural consequences would then reinforce "good eating behavior" after training ceased. The student is introduced to natural consequences by teaching her a response that will

be naturally reinforced in normal settings.

Another technique that has been used to "train to generalize" seems to be at odds with most established instructional methods directed at acquisition. In this method, consequation occurs only for generalized responding. In such situations, the learner would not be reinforced for learning a new skill, but only for using it appropriately outside of training situations.

A final category of research involves processes that Stokes and Baer identified as "mediate generalization." Teaching the individual new methods of thinking and acting or to use cognitive strategies is an example of teaching "mediated generalization" skills, rather than directing programming at generalization of specific skilled responses.

Each method shows some promise but to date no approach has demonstrated consistently good effects in controlled settings, and little research has been conducted in classrooms and homes with teachers and parents implementing the procedures. Our research will seek to extend and develop these and other approaches to the problem, using the methodology discussed in the next section.

Methodology

Subjects and Settings

The subjects will be students attending the Experimental Education Unit and schools of the Direct Service Consortium who meet local, state, and federal classifications as severely handicapped, profoundly handicapped, severely behaviorally disordered, autistic, childhood schizophrenic, deaf-blind, or multiply handicapped. In order to facilitate the identification of subjects while respecting the Rights of Human Subjects Guidelines, these districts will write letters to parents of students explaining the research. Parents or guardians will be given the opportunity to voluntarily consent to their child's participation in a specific study. Teachers of students for whom consent is obtained may also consent to participate in research studies.

Since we are investigating skill generalization, measurement of generalization will occur in a wide variety of natural educational settings, including classroom, school, home, community, and vocational environments. Some studies will involve subjects working

directly with a researcher in a separate room or in a part of the training or classroom setting. Results of research in such controlled settings will be applied to more normal settings. When this occurs, the setting is called an "applied setting." Other studies will involve students working individually or in a group with their regular classroom teacher. Studies in nonschool environments will involve parents, supervisors, peers, neighbors, or others who interact with the subject during normal daily routines.

Subject Responses

In each study, the performance of the student will be measured. Such measurements are used to determine the effects of different types of training, the effects of changing trainers, and the effects of changing settings. Performance data will provide the information we need to better understand the phenomenon of generalization and practical methods of achieving it for many different individuals and many different skills.

The selection of skills or behaviors to be measured will be determined by methodological factors, but will also involve educational considerations of functionality and age-appropriateness. Increasing emphasis is being placed on teaching severely handicapped individuals functional and age-apppropriate skills. It may be appropriate to teach playing with blocks to a preschool child as a leisure skill, but bowling is a far more age-appropriate leisure skill for a teenager. This concept also extends to the selection of instructional materials. While beads and blocks may be appropriate materials to teach a youngster to discriminate objects by shape, spoons and forks are more appropriate for teaching the same skill to a teenager. Furthermore, rather than teaching skills with limited use in most daily environments (i.e., making holiday ornaments), teachers are now concentrating instruction in areas more relevant to daily living and vocational success and ones which introduce the pupil to natural maintaining contingencies.

Some of our research will involve collecting data on behaviors targeted on IEPs, but other factors must be considered. For example, if there are differences between skills or skill clusters, only certain skills will be selected. For example, generalization might better be achieved for the group of dressing skills if training included practice with a wide variety of different types of clothing items (e.g., sweaters trained: cardigans, pullovers, zipback sweaters, v-necked sweaters, etc.), than with repeated practice on items of a single type (crew-necked sweaters). Conversely,

generalization may be hindered for the class of grooming behaviors by training in a wide variety of items, but facilitated by teaching the student to check his own appearance. In some studies, therefore, grooming might be selected, while in others, dressing. As information about generalization accumulates, factors such as these may influence the selection of student responses for study.

In the selection of subject responses it is necessary, especially in the early stages of research, to make sure that any observed changes are the result of the intervention being tested. The researcher may need to ensure that experimental instruction is the only training affecting the performance of the subject. This control is very difficult to achieve if common functional skills are selected. How can the researcher who selects dressing skills be sure that instruction is not being conducted in the home or school, even incidentally? In order to eliminate such effects, tasks which are relevant only to the study may be selected. Effective strategies identifed by studies measuring artificial experimental responses will be applied to functional tasks later on.

Measurement of Generalization

The basic concerns of the collection of data on generalization include, in addition to standard research concerns of reliability and validity, the scheduling of generalization "probes" or measures, the frequency of measurement, and the quality of the generalized response. In most published research, generalization is measured by one or more "probes" or "tests" following the conclusion of training or after the subject has met a predefined criterion performance level on the trained skill. These data can provide us with evidence that generalization did or did not occur. However, if measured "after" only, we really can't determine when generalization began or compare performance with preintervention levels.

Measuring generalization both before and after provides information on the net impact of the training, but leaves other important questions unanswered. Does generalization begin to occur gradually, paralleling acquisition of the skill, or only as some level of mastery is reached? Do different methods of teaching generalized responding promote generalization earlier than others? Does generalization occur soon after training begins or only toward the end of training? With such information, we can begin to understand the relationship between skill acquisition, fluency-building, application, and adaptation. These questions can only be answered by measuring generalization during training and repeatedly over time,

as UWRO will do. Repeated measures or opportunities to perform the generalized response will provide information on the progress of generalization as an ongoing, active process, rather than as an single spontaneous event. Not only will data be collected at different times in relation to an intervention, but multiple probes will be scheduled at each time.

Repeated measures of generalization will also provide information on another aspect of generalization, one that has received little attention -- "training savings." An individual who has been successfully instructed in one skill may learn another skill very quickly as a result of the previous instruction. For example, a student may complete all of the steps required to boil an egg accurately (without breakage or overcooking) and fluently (in the time it takes an average adult to boil an egg) in seven training sessions of 15 minutes each. Following egg training, the student may need only one session to master broccoli cookery. This may be compared with another student who was taught to boil broccoli without egg training, and who took eight sessions to achieve the level of mastery the first student achieved in one. This "savings" of time spent in instruction is another important dimension in building generalization skills and is of practical significance to educators.

Measures of generalization often include only "yes/no" data on whether generalization occurs andr a statement of the accuracy of performance (e.g., 80% correct). These factors alone are probably insufficient for a thorough understanding of the quality of the generalized response. We know that the "time" of the response, expressed as either rate, latency, or duration, is required in addition to accuracy data in order to understand how severely handicapped individuals acquire and build fluency in skills. The length of "waiting" time before responding (latency), the rate of responding, and the duration of the response itself each provide important information on the quality of the response.

A good example of the importance of the temporal quality of generalization is dressing. If a child is taught to dress herself accurately and to finish within 10 minutes during training, it is important to know not only whether or not dressing occurs at home (yes/no data), how many items of clothing are put on correctly (accuracy data), but also how long it takes her (fluency data). Presumably the ten-minute training criterion is set to allow the child to complete dressing within a time limit that is functional for her home environment (e.g., a morning schedule which does not allow for more than 10 minutes dressing). Thus, if training in dressing produces accurate and speedy dressing in the home, the training may be

regarded as entirely successful. However, what is the quality of generalization if the child dresses accurately, but takes 35 minutes to do so? Obviously, the significance of the generalization achieved is less than in the former case. Thirty-five minute dressing may even have more serious consequences for behavior maintenance. The parents, anxious to see the child dressed and breakfasted before the school bus arrives, may decide to "help" the child dress or even dress her themselves. Over time, the opportunity to dress is withdrawn and we would expect that the skill of dressing may even be lost. In order to measure all of the important dimensions in generalized responding, UWRO researchers will collect yes/no, accuracy, and fluency data as measures of skill generalization.

Procedures for Descriptive Studies

UWRO's research activities will begin with studies designed to provide additional information about variables already identified, such as the stimuli, contingencies, consequences, settings, and conditions in environments where generalized responding is desirable. Descriptive studies will also include examination of other variables that may affect skill generalization, such as the scheduling of instruction or the learning characteristics of the individual.

The collection of descriptive data will involve three different types of analyses. Analyses of data collected previously may be used to generate hypotheses, since it is unlikely that the experimenter's bias could affect the data. Similarly, analyses of published research using statistical summaries across studies and discriminate analysis techniques may provide additional information. Descriptive studies will also include data collection in educational settings, without any intervention.

Procedures for Intervention Studies

UWRO's intervention studies include both controlled laboratory studies and investigations in applied settings. The intervention research will utilize two distinct methodological approaches in investigating generalization in severely handicapped individuals: "single subject" and "group" designs. In each methodology, our interest is in determining the effects of various interventions on generalization of the subjects involved in the study.

Single subject research designs include repeated measurement of the target behavior, and thus provide information on the process of

change of the behavior. Data are collected on the target behavior over a period of time before an intervention is introduced. The effect of the intervention is determined by comparing performance before, during, and after the intervention. The relative strength of an intervention is tested by withdrawing the intervention and analyzing any changes. If the intervention cannot be withdrawn, as when an intervention has taught a new way of responding, the intervention is implemented with other behaviors and with other subjects. The data collected on each subject are studied individually and analyzed to determine the process of change involved. Replicating the studies will provide information on the generality of the results.

In group designs, subjects are selected to be representative of a large population and then randomly divided into two or more groups. Sometimes a measure of performance of the target behavior is used as a pre-measure or pre-test. One group is chosen as the control group and another as the intervention group. There may be several different types of interventions tested, but usually only one per experimental group. Following the intervention, a post-test or measure of performance is taken. The effects of the intervention are determined by comparing the performance of the experimental group with that of the control group. The data on each group are studied as a single unit to determine the product or net effect of the intervention. The performance of a single individual is important only as an indication of individual differences within the group. Inferences and results obtained by studing a group may lead to information about how procedures may be likely to affect the population from which the group was originally drawn.

THREE

UWRO'S APPROACHES TO GENERALIZATION

UWRO's research will involve four different but interrelated lines of inquiry to approach the fundamental questions about generalization: Why do some students generalize and others not? What can we educators do to see that all students are able to generalize?

These approaches are distinguished by their basic assumptions and by the types of the intervention strategies investigated. The four approaches to these questions are:

(1) An "ecological" approach to describing and then changing conditions within the educational environment.
(2) A "performance pattern" approach to describing and matching individual learning characteristics and instructional techniques.
(3) A "self-control" approach to teaching severely handicapped individuals to manage their own behavior.
(4) A "cognitive strategy" approach that concentrates on teaching severely handicapped students to use higher order levels of thinking.

The time line for the research activities of the Institute proceeds generally from descriptive studies and tightly controlled laboratory intervention studies to intervention studies in natural environments. The longitudinal descriptive study of existing conditions in training and nontraining settings will continue throughout the project. The hypotheses of the studies designed to intervene in existing ecological conditions are, of all of the areas, most firmly rooted in existing research. Therefore, intervention studies will begin initially in applied settings (e.g., public school classrooms).

The performance pattern research will begin with descriptive studies involving analyses of existing data sets, and then proceed to the collection of descriptive data in public school classrooms. The descriptive information will be used to determine a set of experimental decision rules for matching specific instructional methods to individual performance which will be tested in intervention studies in applied settings during the third and fourth project years.

Without existing data sets or even very much applicable literature, studies in self-control and cognitive strategies will begin with tightly controlled intervention studies under laboratory conditions. Each cognitive strategy and each self-control skill will be investigated in the laboratory before intervention research begins in applied settings. Studies in cognitive strategies will also include investigation of methods of teaching cognitive strategies in applied settings.

During the fourth year of the planned research, guidelines for the application of each method of facilitating skill generalization will be tested in natural settings. According to the contract plan, the

research activities of the Institute will be concluded by the first part of the fifth project year. Our final activities will emphasize dissemination of the research findings. The background, design, and expected results of each of these approaches will be discussed in this chapter.

RESEARCH TIME LINES

	Ecology of Training Settings	Performance Pattern Studies	Self-Control Studies	Cognitive Strategies Studies
Year 1 82-83	**Descriptive** Environment X Indiv. Characteristics (Group 1) **Intervention** (Applied) Massed v. Distributed Trials	**Descriptive** Existing Data Sets	**Intervention** (Laboratory) Self-Monitoring	
Year 2 83-84	**Descriptive** Env. X Charac. (Group 1 & 2) **Intervention** (Applied) Competing Behaviors Instructional Schedules Environmental Simulation	**Descriptive** Existing Instruction X Perf. Patterns	**Intervention** (Applied) Self-Monitoring **Intervention** (Laboratory) Self-Reinforcement Self-Instruction	**Intervention** (Laboratory) Skill Recombination **Intervention** (Applied) Teach Cognitive Strategies
Year 3 84-85	**Descriptive** Env. X Charac. (Groups 1, 2, & 3) **Intervention** (Applied) Instructional Schedules Environmental Simulation	**Descriptive** Existing Inst. X Perf. Patterns **Intervention** (Applied) Decision Rules	**Intervention** (Applied) Self-Reinforcement Self-Monitoring **Intervention** (Laboratory) Self-Instruction Combined Strategies	**Intervention** (Laboratory) Self-Evaluation **Intervention** (Applied) Teach Cognitive Strategies
Year 4 85-86	**Descriptive** Env. X Charac. (Groups 1, 2, 3, & 4) **Intervention** (Applied) Environmental Simulation Guidelines	**Intervention** (Applied) Decision Rules Guidelines	**Intervention** (Applied) Self-Instruction Combined Strategies Guidelines	**Intervention** (Laboratory) Other Cognitive Strategies **Intervention** (Applied) Teach Cognitive Strategies Guidelines

Studies in Ecological Variables

Background and Purpose

While educators frequently lament the failure of pupils with severe learning handicaps to generalize, research has suggested a variety of instructional strategies which could potentially be applied in educational programs to increase the probability of obtaining generalization. Broad categories of modifying instruction for generalization were discussed in the preceding chapter. However, the degree to which these practices have been incorporated into education is unknown, as are factors in educational settings that may limit the effectiveness of these strategies. We will use the word "ecology" to refer to the total of all observable factors and conditions which comprise the educational setting. The purpose of research in this area is to explore the current educational ecology of severely handicapped pupils and selected ways in which ecological conditions might be modified to enhance generalization.

Ecology studies will begin with a four year descriptive study. The longitudinal descriptive study will serve two purposes. The data collected will be used as a general baseline for all of UWRO research, to determine the extent to which our procedures are adopted, as a basis for cost comparisons, and as a general indication of the level of generalized responding with and without UWRO procedures. However, the primary purpose is to explore a variety of the factors in educational settings that may influence generalization. Factors so identified will be investigated in a series of intervention studies.

Design of Longitudinal Descriptive Study

This four year study will explore five major issues.

(1) The nature and number of pupil goals and objectives that include the intent to promote generalization or include behaviors which require generalization in order to be of functional value.
(2) The extent that pupil performance data indicate attainment of goals/objectives related to generalization.
(3) The degree to which formal instructional programming is designed to facilitate generalization, the nature of programming provided, and the extent to which informal practices are employed which seem likely to promote generalization.

(4) The degree to which generalization occurs as a result of formal or informal programming.
(5) General ecological conditions which might facilitate generalization.

Ecological conditions which may be examined include the number of managers administering formal or informal programs throughout the day, the number of intra-school environments in which programming occurs, the percent of the school day in community environments, the degree of interaction or opportunity for interaction with non-handicapped or with lesser handicapped peers, and the number of school-community cooperative programs administered following school hours (e.g., programs administered by parents). Other conditions may be identified through observation and factor analysis.

The descriptive study will include two types of activities. First, a review of existing records (e.g., IEPs, formative data, and lesson plans) for the original sample of approximately 25 severely handicapped pupils selected from Direct Service Consortium schools will be undertaken to collect information on objectives and educational plans. Second, interviews with teachers, parents, andr other caregivers, as well as data collection in classrooms and other environments by members of the project staff, will be necessary to gather information related to current conditions, implementation of procedures, and pupil performance.

Selected members of the original pupil sample will be followed up each year for three additional years in order that a longitudinal record may be developed of generalized skills as they are acquired. This study will also record the changing nature of conditions to which pupils are exposed over time. In addition, new pupils will be selected and added to the sample each year, with similar information collected on each.

Analytic techniques applied to the data will be primarily descriptive and exploratory in nature. Ultimately, the results will be of value in determining which currently employed instructional strategies have a high probability of success, whether certain skills are more likely than others to generalize in the absence of formal programming for generalization, and the basic conditions within community, home, and work environments which should be considered when designing, implementing, and evaluating programs to facilitate generalization for severely handicapped persons. The data collected will be used in the selection of ecological intervention

studies and in the selection of variables and methodologies for other UWRO investigations.

Design of Intervention Studies

The second set of ecological investigations will study interactions between factors identified in the descriptive study and the effect of changing one or more of the existing conditions on the occurrence, quality, and quantity of generalized responding. Factors that are likely to be studied include pupil response variables, general task and setting variables, stimulus variables, response demands, and reinforcement variables as they pertain to the development of generalization.

Although it is impossible to predict all factors that will be investigated, previous studies have identified likely areas. Past research leads us to believe that when generalization does not occur, the individual may have previously acquired a behavior that achieves the same outcome as the behavior being trained. This behavior may compete with the trained behavior in the critical effect of a response. For example, tantrumming to be fed may compete with feeding oneself or asking for food, if each gets the same results. At least one study will be conducted to investigate methods of identifying and managing undesirable competing behaviors and assessing the impact of the interventions on generalization of more desirable responses.

Another intervention study will examine the relationship of generalization to the scheduling of instructional trials. Instructional opportunities or trials are frequently grouped into a single block, with one trial immediately following the next. For example, 10 or 15 trials of "buttoning" instruction might be presented daily from 10:00 to 10:30 a.m. An alternative to this practice would be to provide instruction in buttoning at times when a natural need exists to button one's clothing (e.g., upon getting up in the morning, before going outside, after gym, or after using the toilet). This method for scheduling instruction would result in the provision of trials spaced or naturally distributed throughout the day.

Scheduling instruction at the times when the target behavior would occur in natural environments could prove beneficial for several reasons. (1) It would increase the similarity between the instructional situation and the conditions in which generalized responding is desired. (2) It might increase the likelihood that unprogrammed reinforcers would be available in the natural, generalized setting.

(3) It may avoid problems often noted with the severely handicapped, like "poor attention spans," fatigue, and reinforcer satiation. This series of investigations will provide data on the relative impact of different trial scheduling formats on generalization.

A third potential area for ecological intervention studies involves simulating "natural" environments in instructional settings. Since it is not always possible or practical to teach in natural environments, systematic assessment of the differences between "artificial" and "natural" settings should allow us to identify those variables that actually affect whether or not a generalized response occurs. These critical factors will then be systematically introduced into the "artificial" training situations, producing an arrangement that may be similar to the "natural maintaining contingencies," "common stimuli," and "indiscriminable contingencies" methods discussed by Stokes and Baer. For example, since the natural environment for instruction in washing clothes would be a laundry room rather than a classroom, perhaps an instructional program including the use of a coin-operated washing machine and dryer in the training setting will produce generalization to all laundromats. Generalization obtained during and after training in the "artificial," "modified-artificial," and "natural" environments can then be compared.

The methodology of the intervention studies will be single subject designs replicated across subjects. Repeated measurements of the accuracy and either the rate, duration, or latency of performance of the subjects during the instructional sessions and in the generalization setting will serve as the primary independent variables. In cases where training occurs in the "natural environment," generalization will be measured in different but similar settings. Analytic techniques will include visual inspection of graphed data, time-series statistical techniques, and an overall statistical summary of performance for comparison between studies and with the data collected in the longitudinal descriptive study.

Expected Outcomes and Products

The studies in this area should result in the development of a "best practices" manual, incorporating at least five areas:

(1) Guidelines which identify current best practices existing in public school settings will result from the descriptive studies.

(2) Guidelines for identifying competing behaviors and methods for counteracting their effects in nontraining environments.

(3) Guidelines for how to schedule instructional trials and learning opportunities for different classes of skills.
(4) Guidelines for how to (a) identify critical elements in the "natural" environment and (b) introduce those elements in the training environment.
(5) Other possible guidelines may be developed depending on information from the descriptive studies and the nature and results of the intervention studies.

Studies in Performance Patterns

Background and Purpose

Most people agree that each pupil is an individual and that what might work with one student may not work with another. There is a need to individualize not only in the selection of behaviors to teach, but in how we teach. Individualization usually begins with an identification of the skill areas and behaviors to be taught. Next, detailed inventories of the pupil's skill in each area of the curriculum are conducted to determine, for each behavior selected, the exact level or curricular step at which instruction should begin. Major pupil characteristics which might indicate the need for a particular instructional approach are also identified. The teaching procedures which might prove most effective with mentally retarded children, for example, might be quite different from those which work best with the deaf-blind. Surveys of "learning channels" and "reinforcement preferences" could also be used to help in the development of specific instructional plans. Overall, there is much that can be done to select and develop highly individualized approaches for meeting a pupil's needs.

For the most part, however, educators tend to think of the factors which might determine the effectiveness of an instructional approach as being rather fixed and unchanging. The student is and always will be deaf-blind; the student is "visually oriented," or "prefers juice instead of hugs." In reality, instructional approaches which work quite well on one day may actually hinder further learning on the next. Truly individualized instruction will involve the continuous assessment of daily pupil progress to determine exactly when and how instructional procedures should be modified to keep pace with the changing needs of the pupil.

Fortunately, research over the past decade has identified patterns in the way pupils' learning changes from day to day. Each pattern can be related to specific instructional needs. For example, there is

a surprisingly consistent relationship between a pupil's overall fluency in performing a task and the need for additional guidance. If a pupil is performing a task very slowly (even if overall accuracy is fairly good), strategies such as increased cues, prompts, and directive feedback may facilitate futher progress. However, if the pupil is performing the task fairly quickly, those same strategies may be quite ineffective or even hinder further progress. After noticing the ineffectiveness of one strategy, teachers may need to try three or four different approaches before finding one that works. Of course, soon after finding one that works, the pupil's needs change once more and the process of trying to find effective instruction begins all over again.

By examining the performance characteristics of students who were acquiring or building fluency in a skill, researchers found certain elements of performance to be very important. These included the student's rate or frequency of performance under open conditions, or the latency in responding to a cue or the duration of the response, in addition to the accuracy of the response, the weekly trend or direction of change in the response, and the variability of responding. Five constellations of these elements were identified as specific performance patterns. By examining these characteristics, researchers were able to predict whether or not a specific strategy would help or hinder the student's learning at that time. To replace the guesswork in programs for acquisition and fluency-building, rules to help teachers match instructional strategies to pupil needs as performance changes were developed. Research shows that teachers who follow the rules are able to choose an effective strategy ten times out of twelve.

As successful as the performance pattern rule research has been, to date it has only looked closely at the way in which pupils learn and master new skills in specific instructional situations. Very little is known about the relationship between those patterns of learning and the chances that the new skill will generalize to other situations. It will be the purpose of the performance pattern research at UWRO to investigate those same elements to discover their relationship to generalization. We will then try to match specific patterns with instances and noninstances of generalization. If necessary, we may look at other elements in responding, but we hope that the same elements will prove predictive of generalization. We will attempt to identify the instructional procedures with the highest probability of promoting generalization. If we are successful, we will be able to match particular types of instruction with student's individual needs in order to facilitate generalization.

Design of Descriptive Studies

A great deal of potentially useful information concerning the relationship between patterns of learning and generalization already exists. For example, a published research study, originally conducted to determine the usefulness of feedback in promoting generalization, might be evaluated to look at the relationship between performance patterns and generalization. Similarly, the data already being collected in many classrooms to monitor pupil progress may yield certain clues. There are at least two advantages in using existing data -- it is far less expensive and there is no chance that our expectancies of what should happen might somehow affect what does happen. The disadvantages in using existing data lie in the fact that they may not provide all of the information required for the study (e.g., a researcher may have expressed performances in terms of simple percentages, or accuracy statements. rather than in both accuracy and fluency as desired for the current research), and some question might exist concerning the reliability of the data. Once the existing data have been used to refine specific hypotheses, we will begin to collect our own data.

Experience in special education research has shown that valuable data can be obtained from scientific observation of what is already happening in the classroom, before making any changes. During this phase of the research, the project will simply monitor and document what is already going on and how those activities appear to relate to generalization. During the second project year, descriptive studies will be conducted within the classrooms of the Direct Service Consortium. Severely handicapped pupils with a wide range of disabilities will be included in the study. In previous performance pattern research on skill acquisition and fluency, basic pupil characteristics (i.e., type and level of handicap, age, sex, etc.) were not related to the way in which performance patterns predicted the success of various instructional approaches. Nevertheless, detailed records of pupil characteristics will be kept and evaluated to determine whether those characteristics do relate to the usefulness of performance pattern rules for predicting when and how generalization might be facilitated.

Teachers volunteering for the study will be asked to collect (or to allow project staff to collect) specific information concerning daily pupil progress in a sampling of instructional programs. Concurrently, project staff will monitor each pupil in a variety of other situations to determine if, when, and how the pupil begins to demonstrate new skills outside of the instructional setting.

Design of Intervention Studies

During the third and fourth project years specific studies will be conducted to clarify the relationship between performance patterns in an instructional situation and the likelihood of generalization. For example, if the noninterventional studies conducted during the second year suggest that pupils who achieve a specific level of fluency in the instructional setting are more likely to generalize their skills, then a study during the third year might test that relationship by bringing new pupils up to that level of fluency and noting whether generalization does actually occur. When a reasonably comprehensive set of rules has been developed, the impact of those rules will be tested by training new teachers in their use and evaluating the effect of rule use on generalization.

During the earlier performance pattern studies, the success of a program change was judged by the immediate impact on performance, the change produced in average weekly progress, and the net effect of those two factors on eventual skill mastery. Those same variables will be used to monitor the basic effectiveness of any changes made in the instructional situation to improve generalization, but special probes of the pupil's behavior in a variety of other situations will also have to be conducted to examine generalization. Initially, the degree of generalization at any point in time will be described in terms of the number and type of noninstructional situations in which the behavior is observed to occur, and the degree to which performance characteristics in the noninstructional setting approximate those observed in the instructional situation (in terms of fluency, accuracy, and improvement over time).

Expected Outcomes and Products

If the proposed studies are as successful as earlier work, it should be possible to develop a set of rules which teachers can use to evaluate individual pupil performance and decide if, when, and how they might change instructional procedures to facilitate generalization. Rather than impose a single approach to developing generalization, the rules would help teachers to choose, from among a variety of possible instructional procedures, the best method to meet the individual needs of a pupil at a given point in time. With such rules, it will be possible to truly individualize instruction to take into account each pupil's changing needs.

In addition to a series of research papers and monographs documenting the progress of individual studies, the performance pattern research should result in the creation of a brief "user's manual" which explains how the rules can be used to facilitate skill generalization with severely handicapped pupils. The manual will be written in a manner which is easily understandable to teachers and other educational practitioners and will be as self-contained as possible. The manual will not assume that the reader has any prior knowledge of the skills necessary to use the rules. The actual usefulness of the manual will be tested on a group of teachers toward the end of the fourth project year. The feedback gained from that trial implementation will be used to make modifications during the fifth and final project year.

Studies in Self-Control

Background and Purpose

Typical instructional procedures for skill acquisition and fluency-building rely almost exclusively on a teacher or other trainer acting as the focal point. In almost every research and/or curriculum report, the handicapped person is seen as the one whose behavior is to be changed, rather than the individual who is to change her own behavior. This emphasis is evident when you consider that in most training programs:

(1) The behaviors to be changed are selected by others.
(2) The training materials and procedures are selected by others.
(3) The training procedures are implemented by others.
(4) Changes in behavior caused by training are monitored by others.
(5) Decisions about changes in training procedures are made by others.

Although this instruction has been effective in teaching specific skills, the collective effect of many years of such training may be to teach the handicapped individual total dependence on others for control in each situation. Generalized responding may fail to occur simply because the individual is waiting for someone to give step-by-step instructions in what to do.

Self-control procedures offer an alternative. In self-control training, the individual is taught how to use different techniques to direct her own behavior. It is easy to find examples of self-control techniques

in everyday activities. One common self-management procedure is self-monitoring, or counting the occurrence of one's own behavior. A person who says, "This is only my third cigarette today," is monitoring her own behavior. We've probably all heard someone say, "I'm getting fat, I'll skip dessert." Such individuals are not only monitoring their own behavior, but they are making a decision based on the information as well.

Another technique we use to manage ourselves is called self-instruction; directing the sequence of activities we are performing or are about to perform. People facing several different tasks or a particularly complicated task will often audibly list, to themselves, the sequence of things they are going to do. For example, "I'll start the water for the noodles, then I'll cut up the asparagus, then I'll put the noodles in, next start the asparagus, and hope that they are finished cooking at the same time." A third typical procedure is self-reinforcement, including selecting and delivering consequences for activities. For example, a person may reward himself with time to read the newspaper after he has washed the dishes.

While instances of these activities abound in our daily lives, until recently, little research in self-control has been reported. It is known that many people do not learn to use self-control skills without direct training in the skills. Research does show that self-control skills are usually just as effective as external-control procedures in changing behavior. Moreover, self-control may be better at facilitating maintenance and generalization, since the individual learns independence, rather than dependence.

Can we teach self-control skills to the severely handicapped? Only a few researchers have worked with handicapped individuals, so this question has not yet been answered. We can develop empirical studies to determine if precise skills, such as pushing a button on a counter following task completion (i.e., self-monitoring), can be learned. We can also determine if other self-control activities help the person to change her own behavior and if they are effective in changing other behaviors in new settings. A second puzzle for research concerns the nature of the training. If the methods used to teach self-control skills rely on an external agent, will that method counteract the development of independent control? What other types of training can be used?

It is the purpose of research in this area to investigate whether or not severely handicapped people can be taught to use methods of self-control. If so, what are the best methods of training? And if the self-control skills can be used by individuals to change their own behavior, do such skills improve generalization?

Design of Studies

The variables that will be investigated in these studies will include:

(1) The accuracy and fluency of the performance of the self-control skill.
(2) The length of time required for acquisition and fluency of the self-control skill.
(3) The instructional procedures used to teach self-control.
(4) The effect (i.e., generalization) of the self-control skill on other behaviors.

Although it is difficult to predict the course of future research, we will attempt to investigate each of the three primary self-control skills: self-monitoring, self-reinforcement, and self-instruction.

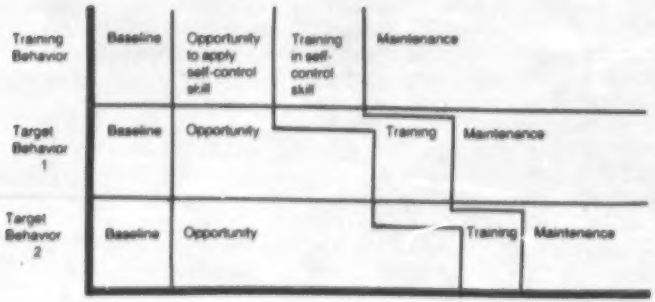
Three other self-control techniques will be integrated into the studies: self-determination of behaviors for change, self-determination of consequences, and self-determination of the ratio of behaviors to consequences. Subjects will be able to select consequences and behaviors to change in most instances, so that they can immediately begin participating in the behavior change process. Individuals who do not respond to questions (e.g., What would you like to work for? What will you do if you make a mistake? How many do you want to earn?) will be presented with a multiple choice situation via pictures, objects, or words during each training session.

Each study will involve the subjects in several different phases. A minimum of three different behaviors will be identified for each subject. One behavior, called the "training behavior," will be selected because it is a skill the individual already does well. Two other behaviors, the "target behaviors," will be the ones we hope to change or affect by the self-control skill, and will be selected by the subject. Repeated measurement data will be collected on the training and target behaviors, in training and nontraining settings, and on the acquisition and generalization of the self-control skill. Data will be summarized and analyzed according to accuracy and fluency of the response, and by changes in the individual's level and direction or trend of performance.

Following the collection of baseline data, the subject will be taught to use a self-control skill. It is very important to select a training behavior that the student has already learned, so that instruction and learning may be concentrated on the self-control procedure. For example, if we are investigating self-monitoring, we might teach the student to count the number of sit-ups completed each gym period, if sit-ups are something the student can already do well.

Once self-monitoring training has started, the subject will have the opportunity to count the target behaviors. The target behaviors might be talking out in class, finishing work on time, or a wide variety of other behaviors which the student selects to change. If the student does not begin to count the target behaviors, she will be taught to do so, beginning with one of the target behaviors and then continuing with the others. The diagram below indicates the general progression of activities. We will examine generalization of the self-control skill across behaviors. If generalization does occur with some of the subjects, later studies will involve the collection of data in different settings as well.

Design of Self-Control Studies



Expected Outcomes and Products

Since there are so few precedents for teaching self-control to severely handicapped students, it is difficult to predict the sequence and nature of the studies. Findings from one study will probably change the direction and methods of subsequent investigations. We will begin with only a few subjects. If results are encouraging, later studies will involve more subjects. If initial studies are successful, classroom teachers will be taught how to include self-control skills in their curricula. It is also possible that parents and others may participate.

Ideally, this research approach will yield information on which self-control skills can be taught and how to teach them to severely handicapped individuals.
We hope that the product of UWRO's research in self-control will be a package of materials for trainers to use in teaching self-control skills to severely handicapped individuals in school, home, community, and vocational settings. Whatever the results, we expect that research in self-control will produce information vital to our understanding of and training for generalization.

Studies in Cognitive Strategies

Background and Purpose

There are at least two important kinds of generalization of learning. One kind of generalization is to apply learned behavior in any other situation. Social skills provide good examples. For instance, regardless of the situation in which one encounters an acquaintance, one can inquire about his well-being with the same question, "How are you?" Once one has learned how to inquire after another's well-being, it is important to generalize that same behavior to different situations. One may ask, "How are you?" whether encountering an acquaintance on the street, upon arriving at the acquaintance's home, or anywhere.

The other important kind of generalization is to recognize when a specific response must be adapted to meet the demands of a new setting. Although there are many strategies that can be involved in skill adaptation, perhaps the simplest is combining two behaviors learned separately to successfully solve a problem. The act of combining changes both of the originally learned behaviors. If they are combined appropriately, they can allow solution of novel problems. Academic and cognitive skills provide good examples. Students can learn to count things, to measure distances, and to combine numbers arithmetically in elementary school. Then, when they encounter physics problems in junior high school, they can combine counting, measuring, and arithmetic to solve the problems. At a simpler level, children can learn to recognize shapes, to put things away, and to look for what they want. Then, when they encounter a game in which different shaped blocks must be put in their proper holes in order to get them all in the same box, they can look for blocks of different shapes one at a time and put them in the appropriate holes.

It is important to know how to promote generalized skill application so that severely handicapped students will not need to be taught every behavior in every context in which it is to be used. It is equally important to know how to promote generalized skill adaptation so that they will not need to be taught every combination of behaviors for every problem to which it applies. Although many theorists have expressed doubts that individuals with low levels of general intelligence can learn the "higher" order thinking that seems to underlie such generalization, like Stokes and Baer, we suppose that all we need are better ways to teach "mediated generalization." That is, we need better ways to teach individuals new ways of organizing their thoughts about what they are doing.

Part of being an effective and independent person is to recognize when to do what one knows. Another part is to recognize when one can combine things that are already known to solve problems one has never solved before. No research has been done to determine how to teach such cognitive strategies to severely handicapped people, although progress has been made in teaching normal and mildly retarded children how to combine behaviors they have already learned in order to perform effectively in novel situations. Such instruction represents a cognitive approach, since its emphasis is on changing strategies of thought. By teaching information processing strategies which provide means of reorganizing available knowledge, the student should be able to generalize his or her behavior skills. The purpose of the cognitive strategy studies at UWRO is to determine whether the principles and practices developed to produce mediated generalization by normal and mildly handicapped people can be used effectively with severely handicapped individuals.

Design of Studies

The initial studies will be tightly controlled laboratory investigations. If we are successful in laboratory settings, we will then work directly with teachers in developing means of translating the methodology into practical procedures. Data will be collected in classroom environments to determine if procedures retain their effectiveness outside of laboratory conditions.

Since this line of investigation has not been applied to severely handicapped individuals before, our plan is to select variables for investigation after we observe how potential subjects behave in pre-investigation observation and testing. Although we are unable to predict the difficulties or the variables which will be involved, it is

likely that data will be collected on the cognitive capabilities of students with or without training in information processing strategies, the degree to which such strategies can be taught, and the effects of strategy training on the occurence of generalization.

We will probably use two groups of subjects, one group receiving training and the other not, in our laboratory studies. Measurement of performance during training will include measures of the accuracy of performance and the number of trials required to achieve criterion. Criterion statements will be used to define levels of performance to be reached before training is terminated. Each criterion statement will include quantifiable measures of how accurately the behavior is performed, as well as the latency or duration of the response.

Since it is most important to discover if generalization occurs, generalization will be tested after training is concluded and take the form of providing "problems" which the subject can solve correctly only by using the cognitive strategies induced by the training. These measurements will include not only a simple statement as to whether generalization occurred, but how quickly the individual is able to "solve" the problem and how much savings of instruction is achieved. Individual and group statistical treatments will be applied to the data.

In the studies in applied settings, similar data will be collected by the experimenter, but procedures developed for the classroom teachers will include methods of measurement that are appropriate for use by practitioners in evaluating the effects of instruction.

The first step in our experimental approach will be to determine whether severely handicapped people spontaneously combine two simple behaviors. The procedure is to teach simple behaviors and then present the subjects with a situation in which they can secure a desired object only by combining two of the behaviors (i.e., by first doing one behavior to secure an item necessary to conduct the second behavior, which will secure the desired object). We expect that many severely handicapped subjects will not spontaneously combine two behaviors. If they do not, we will move to the second phase of our design.

The second phase is to teach a large group of distinct behaviors and then to select pairs of behaviors which the subjects will be taught to combine to achieve desired objects. The focus of these studies will be upon the ways of teaching "how to combine" so that it will quickly generalize to the recombination of other behaviors.

If the studies in teaching skill recombination are successful, we will next try to teach the higher order strategy of self-evaluation. We will try to define methods of teaching the students to predict, before they actually respond in a novel situation, what the effects of their actions are likely to be. Predicting and judging the effects of one's own actions, and then making decisions about which behavior will be the best one, requires sophisticated patterns of thought. Such patterns are essential to the development of generalized adaptation. The design of these studies will proceed from an investigation of how severely handicapped individuals behave in situations requiring judgement and prediction, to the implementation of carefully designed teaching strategies and the investigation of their effects.

Expected Results and Outcomes

Since this area of UWRO research has few precedents, our expectations must be cautious. We hope that we will be able to identify cognitive strategies, beginning with skill recombination and proceeding to self-evaluation, that will teach severely handicapped individuals how to generalize. If successful, we hope to be able to identify practical methods that will allow teachers to provide cognitive instruction in regular school environments. We will then be able to produce not only a series of research reports and publications, but also a manual for teachers to introduce "training to generalize" into the educational environments of severely handicapped individuals.

FOUR

PUTTING IT ALL TOGETHER

Guidelines for identification and manipulation of a wide range of conditions within educational settings will result from the studies in the ecology of training settings. The performance pattern studies will contribute a set of guidelines specifically for instructional methods that educators can use to ensure generalization. Guidelines from the ecology studies will be directed at fairly global management of the instructional setting, while decision rules from the performance pattern studies will be directed at the selection of precise instructional methods used in individual programs.

UWRO Research Schematic

HOW DO CONDITIONS IN THE ENVIRONMENT AFFECT SKILL GENERALIZATION?
ECOLOGICAL STUDIES
HOW TO CHANGE TRAINING SETTINGS
HOW DO INDIVIDUAL DIFFERENCES IN LEARNING AND IN TRAINING TECHNIQUES AFFECT SKILL GENERALIZATION?
PERFORMANCE PATTERN STUDIES
HOW TO MATCH INSTRUCTION TO STUDENTS
DESCRIPTIVE STUDY OF TRAINING ENVIRONMENTS
INTEGRATED "BEST PRACTICES" GUIDELINES FOR PROFESSIONALS
DATA FROM OTHER INSTITUTES
HOW TO TEACH SELF-CONTROL
SELF-CONTROL STUDIES
CAN SEVERELY HANDICAPPED INDIVIDUALS BE TAUGHT TO USE SELF-CONTROL SKILLS TO IMPROVE GENERALIZATION?
HOW TO TEACH COGNITIVE STRATEGIES
COGNITIVE STRATEGY STUDIES
CAN SEVERELY HANDICAPPED INDIVIDUALS BE TAUGHT TO USE COGNITIVE STRATEGIES TO IMPROVE SKILL GENERALIZATION?

During the fourth project year, methods will be developed to combine the guidelines from the ecology and performance pattern studies with other empirical data, into an integrated set of "best practices for generalization." Such guidelines would probably establish a decision hierarchy for use at administrative, training setting, small group, and individual pupil levels. For example, a sequence of decisions might include:

(1) Determine what skills should be programmed for generalization.
(2) Determine the appropriate instructional settings (i.e., home, school, or community) for each skill.

(3) Determine the characteristics of the setting in which generalization is desired.
(4) Determine for each student the percentage of each school day to be spent in each setting, or how to integrate factors from the generalized setting into the training setting.
(5) Determine if instructional trials will be massed or distributed.
(6) Determine the specific instructional procedures for each student.

The guidelines that may result from the studies in self-control and cognitive strategies will affect the curricula of training settings by suggesting changes in the skills that are currently taught. Recommendations, such as the inclusion of self-monitoring in the curriculum, will be accompanied by precise directions as to whom to teach such skills and how such skills might be most effectively taught. It is expected that information on other curricular changes that affect generalization, produced by the work of other institutes, would be used to produce a set of integrated guidelines for curriculum content. If all conditions are ideal, perhaps the guidelines for curricula will be integrated with the guidelines for intervention in the setting and included as an aspect of the decision rules, producing a fully integrated single set of practices.

At this time it is difficult to predict the nature of the various guidelines to be developed or if the guidelines will fit together, since they must be based on empirical evidence that the strategies do, in fact, promote generalized responding. The Institute will be able to draw on the expertise of the Advisory Committee and the Direct Service Consortium in the development of guidelines. We will also have access to results from the other institutes. All of the information available will be integrated into the guidelines eventually produced. It is our hope that the four approaches will provide solutions converging into an integrated set of guidelines for users. The schematic, shown on the title page that precedes Chapter 1, illustrates how UWRO hopes to increase interaction and integration of the results as research proceeds, to the development of an integrated set of guidelines for practitioners.

The Washington Research Organization combines four different and complimentary conceptual approaches to the problem of skill generalization. We believe that pursuit of these four lines of inquiry represents a strategy with the highest probability of defining replacements for the "train and hope" methods on which educators must currently rely. Implementation of the concept of a free appro-

priate public education in the least restrictive environment for all students should not be undermined by ignorance. The contributions the Washington Research Organization makes to the development of a technology of skill generalization are contributions to the work of all who strive for the realization of our social commitment to an effective and lasting education for all severely handicapped individuals.

Cindy is apprehensive her first day on the job at the Pacific Oyster Bar. She failed so badly at the Seattle Hotel. She looks carefully at the dishwasher, and loads the bowls and cups. She closes the door. She searches and finds the buttons on the side of the machine. They are strange, but the little stickers just below them are just like the ones at school. She confidently pushes the series, and smiles when the dishwasher hums into action. At the end of the day, the kitchen supervisor says, "Good work today, Ms. Burchart." He smiles as Cindy gets her coat and leaves. Still smiling, he looks again at the little stickers the trainer from the Seattle Training Center had put on each of the dishwashers. He thinks, "Well, you learn something new every day."

Richard leaves the office of the head housekeeper. As he wheels himself toward the chain of pink cabins of the Sunset Motel, he repeats to himself, "Knock. Then say, 'Housekeeping here.' " Over and over he says these instructions, just as Mr. White taught him to do when he was teaching him to say his name and address, all those years ago. He is pleased that he can practice by himself. At Cabin 1 he stops, squares his shoulders, and knocks briskly. "Housekeeping here." He unlocks the door and goes in to earn his first wage.

Jody is screaming so loudly that his face is eggplant purple again. Mrs. Loomis smiles to herself, and walks out the door to join the rest of the family waiting in the car, leaving Jody's jacket on the floor where he threw it. She gets in the car. "Now where's Jody?" asks Mr. Loomis. "Just wait," she replies. In 30 seconds, Jody comes flying out the door, zipping his jacket. "Don't forget to shut the door," cries his mother. She thinks with satisfaction of Jody's teacher -- she was right, after all! Jody does know how to put on his jacket.